APPENDIX C

PUBLIC MEETING TRANSCRIPT

ORIGINAL

PROPOSED PLANS FOR
THE GROUNDWATER AT SITES
3, 7, 14, 15, 18, AND 20
(PORTION OF OPERABLE UNIT 9)

Public hearing taken at the Best Western Olympic Inn, 360 Route 12, Groton, Connecticut, before Clifford Edwards, LSR, Connecticut License No. SHR.407, a Professional Shorthand Reporter and Notary Public, in and for the State of Connecticut on October 5, 2004, at 6:35 p.m.

A P P E A R A N C E S:

COREY A. RICH, P.E.
TETRA TECH NUS, INC.
661 Andersen Drive
Pittsburgh, PA 15220

MARK D. EVANS
NAVFAC
10 Industrial Highway
Mail Stop #82
Lester, PA 19113

ALSO PRESENT:

MELISSA COKAS
KYMBERLEE KECKLER
CHAU VU
BRYAN OLSON
JESSICA LECLAIR
LARRY GIBSON
MARK LEWIS
EMILY SOUTHARD
EMILY WHIPPLE

MR. EVANS: Tonight's kind of a combination. It's kind of regularly scheduled restoration advisory board meeting that we have every quarter.

But we are also going to use this time to do a public meeting on a proposed remedial alternative out for public comment right now. And we'll get into that in just a little bit.

What we're going to do, I think the only item on the agenda tonight is we're going to actually present the proposed remedial action plan for what we're calling Operable Unit 9.

It's kind of the ground operable water unit for most of the northern part of the sub base. And we'll get into most of the details of that soon.

Well, I guess we might as well do that right now.

MR. RICH: Thanks, Mark.

Good evening, everybody.

As Mark said, my name is Corey Rich. I work for Tetra Tech NUS.

If everybody didn't get one, there's handouts in the back.

There's a handout package plus there are copies of the proposed plan itself that was issued on, I believe, August -- or September 24.

And there's also a copy of the actual public notice back there that was issued on the 24th and there's a sign-in sheet back there, so please sign in.

Next slide, Mark.

Tonight for our presentation, we've just concluded our introduction. The technical presentation will give a brief introductory/review of the regulatory process that we're following here.

We're going to describe the Operable Unit 9, and then we'll get into the details for the proposed plan for the groundwater at these six sites.

in the record of decision.

Once the remedy is selected, we go to the design phase and determine how we're going to implement the remedy. Then we conduct the actual remedy, we get it done, and then generally there's some maintenance and operation concerns with that remedy.

The proposed plan itself is a document used to facilitate public involvement in the CERCLA process, presents the lead agency's, who is the Navy in this case, preferred alternative to address the contamination at a site.

It presents the alternatives that were evaluated and the reasons for recommending the preferred alternative and it's a public participation requirement under CERCLA and the NCP.

And the next phase is a record of decision where we -- it's a legal document that's prepared by Navy in consultation with the support

agencies to document the remedial action. It's a requirement under CERCLA and the NCP. It's a technical document that provides information necessary for determining the conceptual engineering components and outlines remedial objectives and cleanup levels for the selected remedy.

And it's a tool to explain to the public the problems the remedy seeks to address and the rationale for the selection.

Operable Unit 9 which we're here to discuss tonight includes the groundwater at these sites: Sites 2, 3, 7, 9, 14, 15, 18, 20, and 23.

Mark, if you could go to Figure 1.

This is also included in your handout, Figure 1. And it's also part of the proposed plan. I believe it's Figure 10 in the proposed plan.

The areas in this northern region of the sub base that's outlined

here is included in the Operable Unit 9 and these areas over here are included in Operable Unit 9. Site 3, which is one of the sites, is this area in here.

Site 7 is this area right here. Site 14 is a very small site right here. Site 15 is over here. Site 18 is also over there. Site 20 is located up here.

And -- well, this is Site 2 which we won't be discussing tonight, and this is Site 9 and 23 over here.

All those sites make up Operable Unit 9, but we're only here to discuss Sites 3, 7, 14, 15, 18, and 20 tonight, and we'll get into some more details as to why we're only looking at those sites in just a few minutes.

Basically we have sufficient information for those sites I mentioned to select interim remedies.

We're going to collect some additional information at those other three sites -- Sites 2, 9, and

23 -- and evaluate those a little further before we're comfortable in selecting the remedies for the groundwater and in the end we'll sign a final record of decision for the total Operable Unit 9 once we have made our interim decisions for the remedies.

So, to move forward, we're going to discuss those six sites that I mentioned -- Sites 3, 7, 14, 15, 18, and 20 -- and go through the details of those sites and identify what remedies we propose for those sites.

So a quick review of what Site 3 is. Site 3 is the Area A Downstream Water Courses and Over Bank Disposal Area. The site covers approximately 75 acres and contains mainly undeveloped wooded areas and some recreational areas.

The major sources of contamination at the site included historic application of pesticides. There are some abandoned disposal areas.

And Site 7, which is just upgradient of Site 3, had a septic system leach field which released some contamination to the subsurface and has migrated into Site 3.

Site 3 itself, the soil and the sediment at the site, was remediated in 1999 and 2000. Approximately 18,000 tons of material was excavated and disposed of off site.

Most of contamination in the soils and sediments was related to the historic pesticide use or application.

There was also some metals, I believe, in the soils. And there's also another remedial action that is being planned for some petroleum-contaminated soil that was identified at the site. And that was discussed at a public meeting in July of this year, 2004.

This picture gives you general idea of what Site 3 looks like. This is

one of the streams and part of one of the ponds in Site 3 that was remediated back in 1999 and 2000. So it's a fairly, you know, wooded rural area.

To determine what the nature and extent of the contamination is out at the site, the site has been investigated through numerous phases starting with the Phase 1 RI back in the early '90s.

It was further evaluated in the mid '90s, and then we've looked at the groundwater a couple times since then in 2000 and 2002.

Basically, the main contaminants in the groundwater are chlorinated solvents like trichlorethylene. We've seen some of the breakdowns components of trichlorethylene including DCE, or dichloroethylene, and vinyl chloride.

The solvents were mainly detected along one of the streams, Stream 5. It seems to be migrating

along that stream valley, and the likely sources were the leaching fields that I mentioned in Site 7, the Torpedo Shops.

And in general the concentrations have decreased over time. We've been sampling out there for almost a decade and concentrations have generally decreased over time.

So, it doesn't appear that there's a significant continuing source out there right now. It seems to be dropping off.

Figure 2 gives us a summary of the main contaminants out there. It's going to be better for you to look probably at your handout to see the actual concentrations. I may actually have to do the same.

This figure shows us the kind of the major contaminant concentrations that we had out there. And, in general, the concentrations aren't that high. They generally just

exceed MCLs or some regulatory criteria.

They're not extremely high by any means. I believe our maximum concentration of vinyl chloride was detected over here at 2DMW29S back in 2000 and we had 31 parts per billion. And some of our highest TCE concentrations are, say, 9 to 10 parts per billion.

So those aren't extremely high, but they do exceed regulatory criteria and do present a potential concern to receptors.

We also found during the investigation in 2002 some polynuclear aromatic hydrocarbons in the groundwater samples, but we took a look at the data and the data itself was from temporary wells, and they had some high suspended solids.

And it appeared these results were an artifact of those -- some petroleum contamination at the Site 3 new source area that were suspended in

the groundwater samples versus actual groundwater contamination itself.

We used the groundwater data in human health risk assessments, and the risks that were the results of the risk assessment showed us that there's really no unacceptable risk to current receptors such as a construction worker under the industrial setting that's out there right now.

But if you would -- if it would be developed as a residential area in the future and groundwater would be used for drinking water source, there would be unacceptable risks from the groundwater itself.

The main contaminants that would drive those risks are TCE, or trichlorethylene, and vinyl chloride.

We took a look at potential eco concerns and, in general, there's no risk anticipated from the migration of the groundwater contaminants to the surface water.

But the petroleum we've identified at Site 3 presents a potential issue and this will be addressed during an upcoming remedial action.

Because there are potential risks at the site, we needed to proceed from the RI to the Feasibility Study stage. We developed remedial action objectives to focus the direction of the feasibility study.

And the objectives we identified were to protect any current receptors from incidental exposure to groundwater contaminated with petroleum or chlorinated solvents above preliminary remediation goals which we identified based on existing regulatory criteria and from the risk assessment.

We also want to protect future receptors from drinking the water -- that would be a residential scenario -- and also make sure we protect the ecological receptors at the

site.

Once we developed our remedial action objectives, we go through a screening process. We develop -- we look at various technologies and go through a screening process which allows us to come to various alternatives that we explore in more detail.

We went through that process and because of the sporadic nature of our contaminants and the widespread distribution of the contaminants, we didn't seem to have an actual plume itself. It was kind of some low level concentrations across the site.

The site is under Navy control. There's no current use of the groundwater and the groundwater itself is currently classified by the State.

That all kind of focused us into just two alternatives being viable for the site itself. And they

were, one, the no action alternative, which is a required alternative under CERCLA for us to look at as a comparison, and also we looked at institutional controls with monitoring.

The no action alternative would, in present worth dollars, cost about $89,600, and it would involve just keeping an eye on the site and doing our five-year site reviews just to verify that there's no real concerns with the site in the future.

Under the institutional controls with monitoring, the present worth cost of this alternative would be approximately $320,000.

We would need to identify the location and the magnitude of the groundwater contamination and then, through institutional controls, restrict any extraction or use of the groundwater so there's no adverse impacts to human health or the environment.

We would also monitor any

migration and degradation of the contaminants so that we know when we've reached our remedial goals for the groundwater.

And, throughout this process, we would also need to conduct our five-year site reviews just to confirm that the site's -- that the remedy is still protective and still being implemented as discussed in the ROD.

So those are the alternatives for Site 3, and I'll summarize the Navy's preferred approach at the end of the presentation. So I'll present the preferred remedy at the end.

The next site we looked at was Site 7. It's the Torpedo Shops, and it's located in the northern portion of sub base New London. And as the name indicates, they conduct maintenance activities on torpedoes on the site.

The main contaminants have been solvents and petroleum products

that are used there or stored at the site. And it appears that there was a septic system used at the site until the early '80s and some of these solvents were dumped down or just got disposed of in this septic system and appear to have migrated into the groundwater.

There is also some underground storage tanks at the site, and petroleum product was stored and used at the site.

There may have been some leaks from those. We also discussed the soil and contaminated -- or soil and waste at the site during our July public meeting, and we've identified a remedial action to address that contaminated soil and that's currently being planned and will be conducted probably next year sometime.

There was -- looks like some solvent-contaminated soil or waste still related to the septic system that we need to address on the west side of

Building 325, and there appears to be some PAH-contaminated soil on the south side of Building 325.

This is actually Building 325 here. This would be the west side of the building, and the septic system -- septic tank is over in this area, and there's a line that's over here and the leach field is over here.

This would be the south side of the building where the underground storage tanks used to be and where some PAH-contaminated soil was identified.

The torpedo shops have been investigated for almost a decade as well, starting back in the early '90s and finishing up here in early 2000. The solvent contamination that we've seen near the septic system, most of the contaminants that were identified were benzene, chlorobenzenes, and TCE.

If you go to Figure 3, I believe this is Figure 3 in the handout.

If you'd look at your handout, the septic tank itself we believe is in this area right here from historic drawings and so forth. This hatched area is what we think is a small plume, maybe emanating from that area.

We've had some dichlorobenzene hits, about 90 parts per billion, up in that area, and chlorobenzene at 165 parts per billion.

We've also had some sporadic TCE hits throughout the site. Up in this area, we had a hit of about 7 to 8 parts per billion.

There was a northern leach field up in this area which the actual leach field is kind of right in behind that tag. That may have been the source of some of the TCE, but we're seeing some of the chlorobenzenes and benzenes and they seem like they're coming out of this area where this former septic tank was.

We used the existing groundwater data that we collected to do

risk assessments similar to what we had seen in Site 3. We have some low level contamination which doesn't impact the current receptors at the site.

But the concentrations are high enough that they might impact a future resident if that sort of scenario would be applicable to this site.

So, there are potential risks to these future residents and the benzene -- chlorobenzenes and the TCE would be the risk drivers. The ecological risks there wouldn't be any real significant risks to the ecological receptors at the site.

So we went through this -- we went through a Feasibility Study for this site because of those potential risks to future receptors. We identified similar remedial action objectives for the groundwater.

We want to protect the receptors to exposure from the groundwater. We want to protect future

receptors from the groundwater and we want to make sure that the ecological receptors stay safe.

In this -- for this site, we did look at three different alternatives. Contrary to Site 3, the chlorinated contaminants, especially the chlorobenzenes and the benzenes, seem to be localized and allowed us to explore an alternative of extraction and off-site discharge that is more aggressive and proactive.

And we also included similar alternatives such as no action and institutional controls with monitoring for the groundwater.

Basically, the costs were similar for the no action and we're just looking at the same thing, looking at the mandatory five-year site reviews.

For the institutional controls, it would be a slightly different monitoring program but it would involve very similar concepts. We

want to identify the location and magnitude of the contamination.

And we want to restrict extraction and use of the groundwater. We'll monitor it until the contaminants degrade to remedial goals and we'll conduct five-year reviews during that time frame. The costs would be about $304,000.

For the extraction and off-site discharge, we would need to install and operate and subsequently decommission a groundwater extraction system. We would removed almost 1,250,000 gallons of contaminated water and then treat it, pretreat it, and then discharge it to the public-owned treatment works or the public sewer system.

And the extraction system itself would be just one well pretty much on the downgrading edge of that small plume area that we showed, and you'd be pumping that well at about 4

gallons a minute to extract the 1,250,000 gallons water.

And we estimated that it would take about 31 weeks to do for a cost of a little over a million dollars. So, quite a bit higher than these other two alternatives and, as we'll see, it's fairly cost prohibitive to do something that -- to that level for this type of contamination and the potential risks associated with it.

The next site, Site 14, the acronym OBDANE stands for Over Bank Disposal Area Northeast, Site 14's located near Sites 3 and 7, as discussed earlier.

It was basically an area where miscellaneous wastes were dumped over the edge of a ravine.

It was a handy spot for trucks to pull up and dump over in the past for the Navy. There was an area of about 80 feet in diameter where the wastes were dumped over the hillside.

The actual wastes and contaminated soils were cleaned up in 2001. About 270 tons of material was removed and the site was restored.

This is what the site looks like now. This hillside here is where the waste itself was. So it's in pretty good shape now as far as the soils were concerned.

We took a look at the groundwater here during several sampling events and, in general, we just saw naturally-occurring metals in the groundwater, no real contaminants of concern at the site.

So we didn't see any unacceptable risks to human health from exposure to the groundwater. We didn't anticipate any unacceptable risks to ecological receptors from the groundwater. So because there were no risks, we had no reason to proceed to an FS for the groundwater so the process will basically stop here.

The next site, Site 15, is the Spent Acid Storage Disposal Area. It is located in the southern part of the sub base near Buildings 409 and 410. It was a historic -- historically used to store spent or waste battery acid.

Subs historically used batteries for power and so they had a lot of battery acid. They would dump it there and subsequently, I believe, take it up to Area A Landfill for disposal.

The Navy identified it as a significant concern back in the early '90s, and they did a time critical removal action in 1995 when they took out the tank, its contents, and about 320 tons of lead-contaminated soil, and that soil was disposed of off site.

You can see this somewhat triangular area here, the cut line in the pavement is where the spent acid storage tank was and where the removal action was completed.

It was investigated

numerous times, both soil and the groundwater. The early investigations focused on soil and groundwater, and the State of Connecticut actually conducted a supplemental sampling event in '97 to confirm that there was no remaining soil contamination out there. A no further action source control ROD was signed for the site in that same year.

As part of a groundwater investigation conducted in 2000, and the report was issued in 2002, TCE and some metals were identified in the groundwater at the site which seemed to indicate that there were continuing problems at the site that may not have been addressed.

We went back out in 2002 just to take a look at the site. We collected some additional groundwater samples, installed some additional wells, and also took some additional soil samples.

And what we found was it

appears that we had some problems with our 2000 results and some of the possible factors that contributed to the anomalies were -- we used some different sampling techniques and the laboratories may have had some interference issues with the metals that we were analyzing for, and some of the wells that were sampled hadn't been sampled for almost six or seven years and they weren't redeveloped.

So we think we had some issues with our sampling event because the results of our 2002 investigation matched similar results that we had seen in our historic investigation. So we had one data set that seemed to be skewed from all the rest.

So once we felt comfortable with the data set after looking at it a few times, we reevaluated the human health risks from exposure to groundwater and they were acceptable. There's no real exposure

pathway for ecological receptors at the site, so again, we had no reason to proceed to an FS for the groundwater.

The fifth site we looked at was Site 18, or the Solvent Storage Area. It's also located very close to Site 15 in the southern portion of New London. It's a building that was used to store gas cylinders and 55-gallon drums of solvents.

This is the building itself. Nothing really to speak of other than it was a building. We did an investigation at the site in 2000 and, in general, we didn't find any significant groundwater contamination at the site with the samples that we collected.

We saw some metals. Generally the groundwater was very good at the site. So we had no unacceptable human health risks.

Again, there were no ecological receptors, no pathway to

them, and there was no reason again to proceed to an FS for the groundwater at the site.

The sixth and final site that we're here to discuss tonight is the Area A Weapons Center, Site 20. The site includes just one building, 524, and there are weapons storage bunkers there.

The contaminants at the site itself generally are related to small quantities of the chemicals and chemical waste that they generate on the site, and there's also liquid fuels and explosives that are stored in the bunkers associated with the torpedoes that are used for the submarines at the sub base in New London.

A small remedial action was conducted to address soil contamination at the site back in 2001. They took out 200 cubic yards of PAH and inorganic contaminated soil.

So this gives you -- I

think they did some remedial action somewhere in this area here or across in the stream here.

You can kind of see the bunkers on the side here. This site has been investigated several times. We saw some low level concentrations of volatiles and semivolatiles out at the site, and the examples are TCE, we did see some low concentrations of TCE, and the polynuclear aromatic hydrocarbons. And we also saw some naturally occurring metals at the site.

Back in the -- say the Phase 2 RI, we identified some potential risks at the site. We did subsequent investigations at the site in 2000 and 2002 to evaluate the data further, get a better handle on the contaminants out at the site.

Through that time frame, there were some changes in risk assessment methodology and analysis methods and so forth, but we took a look

at that entire data set and looked at it and determined that there's really no significant human health risks associated with the groundwater at the site.

There's generally no ecological risk assessment -- or no ecological risks associated with the groundwater and, again, we didn't have any reason to proceed to an FS since there were no risks associated with the groundwater at the site.

So after we went through our evaluation and we did the Feasibility Studies for the groundwater at Sites 3 and 7, we decided that the best approach for the groundwater at these two sites was to select one approach that we could use to address the contamination at both sites and lump them together.

And they were the institutional controls and monitoring alternatives that I identified before for

GW Groundwater Alternative 1-2 and Groundwater Alternative 2-2.

The actual remedies themselves will involve implementing these institutional controls. The Navy will need to develop mapping to show the location, magnitude, and type of contamination, and they'll need to enforce restrictions and extractions on the use of the groundwater.

If we go back to Figure 1 -- again, it's part of your handout -- this map shows the areas where it will have these restrictions. They are highlighted in this golden color. So this area, which is about 75 to 80 acres, will have restrictions on it.

The sub base New London has a current document that they implement their restrictions in. What's it called? Base instruction, restriction instruction. These figures will get implemented into that and they will enforce the restrictions.

We'll develop a long-term or groundwater monitoring program that will cover what will be performed as part of the monitoring program until the remedial goals are reached.

They will identify the specific monitoring wells that will be included, the analytical parameters, and generally just all the specific details for the monitoring program.

The Navy will conduct five-year reviews as required under CERCLA until the remedial goals are reached, and the total cost is basically a combined cost of these two alternatives that are developed and it will be approximately $620,000 and that is the estimated cost for 30-year life cycle.

The goals that we've selected for the groundwater at these sites, these are the goals that we want to reach through this process. We have

identified all the contaminants and then these are our remedial goals.

So, for dichlorobenzene, we would be looking at 75 micrograms per liter or parts per billion. Benzene would be one part per billion. Chlorobenzene would be a hundred. Hexachlorobenzene would be one part per billion. TCE would be five, and vinyl chloride would be two.

You can also see in brackets that we've identified what site this contaminant is currently a concern at, and we would develop our monitoring program to identify these contaminants at these particular sites so we know we have obtained these goals in the future.

Those goals are generally -- have been selected, I believe, from federal and state MCLs and/or the Connecticut RSRs, or remediation standard regulations. They're generally all about the same.

And for the groundwater at

the remaining four sites -- or Sites 14, 15, 18, and 20 -- we recommend no further action because the available information indicates that the groundwater at these sites does not present any unacceptable risks to human health or the environment.

So, to summarize where we're at on the schedule for these sites, we're currently in the public comment period.

The proposed plan was issued on the 24th of September, and the public comment period will end up on October 25. We're here tonight to have our public meeting to identify everything to the public.

Once we get our comments and we'll respond to those and address any issues that are identified in the October to November time frame as part of the responsiveness summary, and then we'll prepare a final record of decision and that should go out sometime in

December of 2004.

And these are the points of contact for the work that we're doing. Mark Evans is in the front here running the slide presentation for me, and Melissa is sitting back there. Kimberlee is here and Mark Lewis from the state is also here. So if you have any other questions that you would like to raise to them, I've provided their contact information for you.

So that concludes my technical presentation. At this time, we'll open up the floor for any questions. Since this is a public meeting, we do have a stenographer here and he's recording minutes of the meeting.

So we would like -- if you would -- if you have a specific question, please state your name and your question and we'll try to respond to it here or we can provide a written response at a later time if we can't

address it right now.

Anybody have any specific questions?

Okay. That concludes our public meeting at 7:20.

(THEREUPON, THE HEARING WAS CONCLUDED AT 7:20 p.m.)

AGENCY CERTIFICATE

We hereby certify that a Notary Public, in and for the State of Connecticut, duly commissioned and qualified to administer oaths, was present at the foregoing hearing.

We further certify that the foregoing transcript was taken stenographically by a representative of our firm and reduced to typewriting under our direction, and the foregoing is a true and accurate transcript of the hearing.

We further certify that we are neither of counsel nor attorney to any of the parties to said cause, nor are we an employee of any party to said cause, nor are we interested in the outcome of said cause.

Witness my hand as Notary Public

this 10 of October, 2004.

Cunningham Services

SUBASE NEW LONDON

Public Meeting/RAB

October 5, 2004

Attendee Roster

Name	Organization	Phone/Fax	e-mail
Melissa Cokas	SUBASE Environmental	860-694-5191/5320	melissa.cokas@navy.mil
Mark Evans	EFA NE - Navy	610-595-0567	Mark.Evans1@navy.mil
Corey Rich	Tetra Tech	412-367-6283	richc@ttnus.com
Kymberlee Keckler	USEPA	617.918.1385/1294	keckler.kymberlee@epa.gov
Chau Vu	USEPA	617-918-1446	vu.chau@epa.gov
Bryan Olson	US EPA	617-918-1365	OLSON.BRYAN@EPA.GOV
Jessica LeClair		860-550-7000	lolalc4@earthlink.net
Larry Gibson	RAB	860-464-8281	lhgib@aol.com
Mark Lewis	CT DEP	860-424-3768	mark.lewis@po.state.ct.us
Emily Arthur	[illegible]	860 401 3111	[illegible]
Emily Whipple	Conn College	860 439 4460	ejwh,2@conn.edu

APPENDIX D

HUMAN HEALTH RISK ASSESSMENT
RAGS PART D TABLES

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.

REASONABLE MAXIMUM EXPOSURES

CENTRAL TENDENCY EXPOSURES

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 19, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 3	1,1,2-Trichloroethane	- -	--	1.6E-10	--	1.6E-10	Blood	--	- -	0.00005	0.00005
			Trichloroethene	- -	--	5.5E-11	--	5.5E-11	Liver	--	- -	0.000	0.000
			Vinyl Chloride	- -	--	1.5E-09	--	1.5E-09	Liver	--	- -	0.00005	0.00005
			Benzo(a)pyrene	- -	--	2.6E-07	--	2.6E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	- -	--	9.2E-07	--	9.2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	- -	--	7.3E-08	--	7.3E-08	NA	--	- -	--	--
			Alpha-BHC	- -	--	1.8E-09	--	1.8E-09	NA	--	- -	0.00004	0.00004
			Arsenic	- -	--	6.5E-09	--	6.5E-09	Skin, CVS	--	- -	0.001	0.001
			Chemical Total	- -	--	1.3E-06	--	1.3E-06		--	- -	0.001	0.001
		Exposure Point Total						1.3E-06					0.001
	Exposure Medium Total							1.3E-06					0.001
Medium Total								1.3E-06					0.001
Receptor Total							Receptor Risk Total	1.3E-06				Receptor HI Total	0.001

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TINUS, 2004).

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 3	1,1,2-Trichloroethane	1.3E-06	--	9.2E-08	--	1.4E-06	Blood	0.01	--	0.0009	0.01
			Trichloroethene	2.6E-07	--	3.2E-08	--	2.9E-07	Liver	0.009	--	0.001	0.01
			Vinyl Chloride	1.7E-05	--	6.4E-07	--	1.8E-05	Liver	0.02	--	0.0007	0.02
			Benzo(a)pyrene	1.1E-05	--	1.8E-04	--	1.9E-04	NA	--	--	--	--
			Dibenzo(a,h)anthracene	2.6E-05	--	6.3E-04	--	6.6E-04	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.0E-06	--	5.0E-05	--	5.3E-05	NA	--	--	--	--
			Alpha-BHC	2.1E-06	--	1.2E-06	--	3.3E-06	NA	0.002	--	0.0009	0.002
			Arsenic	4.5E-04	--	1.1E-06	--	4.5E-04	Skin, CVS	2.3	--	0.006	2.3
			Chemical Total	5.1E-04	--	8.6E-04	--	1.4E-03		2.4	--	0.01	2.4
		Exposure Point Total						1.4E-03					2.4
	Exposure Medium Total							1.4E-03					2.4
	Groundwater	Site 3	1,1,2-Trichloroethane	--	1.3E-06	--	--	1.3E-06	Blood	--	0.01	--	0.01
			Trichloroethene	--	2.6E-07	--	--	2.6E-07	Liver	--	--	--	--
			Vinyl Chloride	--	1.7E-05	--	--	1.7E-05	Liver	--	0.02	--	0.02
			Benzo(a)pyrene	--	--	--	--	--	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Alpha-BHC	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	--	--	--	--	Skin, CVS	--	--	--	--
			Chemical Total	--	1.9E-05	--	--	1.9E-05		--	0.04	--	0.04
		Exposure Point Total						1.9E-05					0.04
	Exposure Medium Total							1.4E-03					2.4
Medium Total								1.4E-03					2.4
Receptor Total							Receptor Risk Total	1.4E-03				Receptor HI Total	2.4

Note:

Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

Total Blood HI	0.03
Total CVS HI	2.3
Total Liver HI	0.05
Total Skin HI	2.3

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION
NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	--	--	--	--	--	None Specified	--	--	0.002	0.002
			1,4-Dichlorobenzene	--	--	2.0E-08	--	2.0E-08	None Specified	--	--	0.002	0.002
			Chlorobenzene	--	--	--	--	--	Liver	--	--	0.003	0.003
			Benzene	--	--	3.2E-10	--	3.2E-10	None Specified	--	--	0.0001	0.0001
			Trichloroethene	--	--	6.5E-10	--	6.5E-10	Liver	--	--	0.0007	0.0007
			Bis(2-ethylhexyl)phthalate	--	--	6.8E-08	--	6.8E-08	Liver	--	--	0.02	0.02
			Hexachlorobenzene	--	--	3.3E-07	--	3.3E-07	Liver	--	--	0.02	0.02
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Barium	--	--	--	--	--	CVS, Fetus	--	--	--	--
			Chromium	--	--	--	--	--	None Specified	--	--	0.04	0.04
			Lead	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	None Specified	--	--	0.01	0.01
			Chemical Total	--	--	4.2E-07	--	4.2E-07		--	--	0.09	0.09
		Exposure Point Total						4.2E-07					0.09
	Exposure Medium Total							4.2E-07					0.09
Medium Total								4.2E-07					0.09
Receptor Total							Receptor Risk Total	4.2E-07				Receptor HI Total	0.09

From Basewide Groundwater Operable Unit Remedial Investigaiton Report, TtNUS (2002a).

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	- -	--	- -	--	- -	None Specified	0.05	- -	0.04	0.09
			1,4-Dichlorobenzene	2.6E-05	--	1.3E-05	--	3.9E-05	None Specified	0.08	- -	0.04	0.1
			Chlorobenzene	- -	--	- -	--	- -	Liver	0.2	- -	0.06	0.3
			Benzene	1.3E-06		1.5E-07		1.4E-06	None Specified	0.02	- -	0.002	0.02
			Trichloroethene	3.0E-06		3.8E-07		3.3E-06	Liver	0.1	- -	0.01	0.1
			Bis(2-ethylhexyl)phthalate	3.1E-05		4.7E-05		7.9E-05	Liver	0.3	- -	0.4	0.7
			Hexachlorobenzene	5.6E-05		2.3E-04		2.9E-04	Liver	0.1	- -	0.4	0.5
			Arsenic	2.0E-04		- -		2.0E-04	Skin	1.0	- -	- -	1.0
			Barium	- -	--	- -	--	- -	CVS, Fetus	0.2	- -	- -	0.2
			Chromium	- -	--	- -	--	- -	None Specified	1.2	- -	0.2	1.4
			Lead	- -	--	- -	--	- -	NA	- -	- -	- -	--
			Vanadium	- -	--	- -	--	- -	None Specified	0.6	- -	0.06	0.6
			Chemical Total	3.2E-04	--	2.9E-04	--	6.1E-04		3.8	- -	1.3	5.1
		Exposure Point Total						6.1E-04					5.1
	Exposure Medium Total							6.1E-04					5.1
	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	--	- -	--	--	- -	None Specified	- -	0.05	- -	0.05
			1,4-Dichlorobenzene	--	2.6E-05	--	--	2.6E-05	None Specified	- -	0.08	- -	0.08
			Chlorobenzene	--	- -	--	--	- -	Liver		0.2		0.2
			Benzene	--	1.3E-06	--	--	1.3E-06	None Specified		0.02		0.02
			Trichloroethene	--	3.0E-06	--	--	3.0E-06	Liver		0.1		0.1
			Bis(2-ethylhexyl)phthalate	--	- -	--	--	- -	Liver		- -		- -
			Hexachlorobenzene	--	- -	--	--	- -	Liver		- -		- -
			Arsenic	--	- -	--	--	- -	Skin	- -	- -	- -	- -
			Barium	--	- -	--	--	- -	CVS, Fetus	- -	- -	- -	- -
			Chromium	--	- -	--	--	- -	None Specified	- -	- -	- -	- -
			Lead	--	- -	--	--	- -	NA	- -	- -	- -	- -
			Vanadium	--	- -	--	--	- -	None Specified	- -	- -	- -	- -
			Chemical Total	--	3.0E-05	--	--	3.0E-05		- -	0.5	- -	0.5
		Exposure Point Total						3.0E-05					0.5
	Exposure Medium Total							3.0E-05					0.5
Medium Total								6.4E-04					5.6
Receptor Total							Receptor Risk Total	6.4E-04				Receptor HI Total	5.6

Note:
Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.
From Basewide Groundwater Operable Unit Remedial Investigation Report, TtNUS (2002a).

Total Skin HI	1.0
Total Liver HI	1.9
Total CVS HI	0.2
Total Fetus HI	0.2
Total None Specified HI	2.4

6/28/2004

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	--	--	0.002	0.002
			Chemical Total	--	--	--	--	--		--	--	0.002	0.002
		Exposure Point Total						--					0.002
	Exposure Medium Total							--					0.002
Medium Total								--					0.002
Receptor Total							Receptor Risk Total	--				Receptor HI Total	0.002

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	0.2	--	0.01	0.3
			Chemical Total	--	--	--	--	--		0.2	--	0.01	0.3
		Exposure Point Total						--					0.3
	Exposure Medium Total							--					0.3
	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	--	--	--	--
			Chemical Total	--	--	--	--	--		--	--	--	--
		Exposure Point Total						--					--
	Exposure Medium Total							--					0.3
Medium Total								--					0.3
Receptor Total							Receptor Risk Total	--				Receptor HI Total	0.3

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION
NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	--	--	5.2E-09	--	5.2E-09	Liver	--	--	0.003	0.003
			Benzo(a)pyrene	--	--	1.1E-07	--	1.1E-07	NA	--	--	--	--
			Antimony	--	--	--	--	--	Blood	--	--	--	--
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Nickel	--	--	--	--	--	Body Weight	--	--	--	--
			Silver	--	--	--	--	--	Skin	--	--	--	--
			Thallium	--	--	--	--	--	None Specified	--	--	--	--
			Chemical Total	--	--	1.1E-07	--	1.1E-07		--	--	0.003	0.003
		Exposure Point Total						1.1E-07					0.003
	Exposure Medium Total							1.1E-07					0.003
Medium Total								1.1E-07					0.003
Receptor Total							Receptor Risk Total	1.1E-07				Receptor HI Total	0.003

From Basewide Groundwater Operable Unit Remedial Investigation Report, TINUS (2002a).

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	6.5E-07	--	8.2E-08	--	7.3E-07	Liver	0.02	--	0.003	0.03
			Benzo(a)pyrene	4.3E-06	--	7.4E-05	--	7.8E-05	NA	--	--	--	--
			Antimony	--		--		--	Blood	0.2	--	--	0.2
			Arsenic	2.7E-04	--	--	--	2.7E-04	Skin	1.4	--	--	1.4
			Nickel	--	--	--	--	--	Body Weight	0.1	--	--	0.1
			Silver	--	--	--	--	--	Skin	1.8	--	--	1.8
			Thallium	--	--	--	--	--	None Specified	1.5	--	--	1.5
			Chemical Total	2.7E-04	--	7.4E-05	--	3.5E-04		5.1	--	0.003	5.1
		Exposure Point Total						3.5E-04					5.1
	Exposure Medium Total							3.5E-04					5.1
	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	--	6.5E-07	--	--	6.5E-07	Liver	--	0.02	--	0.02
			Benzo(a)pyrene	--	--	--	--	--	NA	--	--	--	--
			Antimony	--	--	--	--	--	Blood	--	--	--	--
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Nickel	--	--	--	--	--	Body Weight	--	--	--	--
			Silver	--	--	--	--	--	Skin	--	--	--	--
			Thallium	--	--	--	--	--	None Specified	--	--	--	--
			Chemical Total	--	6.5E-07	--	--	6.5E-07		--	0.02	--	0.02
		Exposure Point Total						6.5E-07					0.02
	Exposure Medium Total							6.5E-07					0.02
Medium Total								3.5E-04					5.1
Receptor Total							Receptor Risk Total	3.5E-04				Receptor HI Total	5.1

Note:
Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.
From Basewide Groundwater Operable Unit Remedial Investigaiton Report, TINUS (2002a).

Total Skin HI	3.2
Total Liver HI	0.05
Total Blood HI	0.2
Total Body Weight HI	0.1
Total None Specified HI	1.5

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 3	1,1,2-Trichloroethane	--	--	4.9E-11	--	4.9E-11	Blood	--	--	0.00002	0.00002
			Trichloroethene	--	--	1.7E-11	--	1.7E-11	Liver	--	--	0.00002	0.00002
			Vinyl Chloride	--	--	4.2E-10	--	4.2E-10	Liver	--	--	0.00001	0.00001
			Benzo(a)pyrene	--	--	9.1E-08	--	9.1E-08	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	--	3.2E-07	--	3.2E-07	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	2.6E-08	--	2.6E-08	NA	--	--	--	--
			Alpha-BHC	--	--	6.2E-10	--	6.2E-10	NA	--	--	0.00001	0.00001
			Arsenic	--	--	1.6E-09	--	1.6E-09	Skin, CVS	--	--	0.0003	0.0003
			Chemical Total	--	--	4.4E-07	--	4.4E-07		--	--	0.0003	0.0003
		Exposure Point Total						4.4E-07					0.0003
	Exposure Medium Total							4.4E-07					0.0003
Medium Total								4.4E-07					0.0003
Receptor Total							Receptor Risk Total	4.4E-07				Receptor HI Total	0.0003

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 3	1,1,2-Trichloroethane	1.9E-07	--	1.6E-08	--	2.0E-07	Blood	0.006	--	0.0005	0.007
			Trichloroethene	3.6E-08	--	5.2E-09	--	4.1E-08	Liver	0.004	--	0.0006	0.005
			Vinyl Chloride	2.4E-06	--	1.0E-07	--	2.5E-06	Liver	0.009	--	0.0004	0.009
			Benzo(a)pyrene	1.6E-06	--	2.9E-05	--	3.1E-05	NA	--	--	--	--
			Dibenzo(a,h)anthracene	3.6E-06	--	1.0E-04	--	1.1E-04	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4.2E-07	--	8.3E-06	--	8.7E-06	NA	--	--	--	--
			Alpha-BHC	2.9E-07	--	2.0E-07	--	4.9E-07	NA	0.0007	--	0.0005	0.001
			Arsenic	6.3E-05	--	1.5E-07	--	6.3E-05	Skin, CVS	1.1	--	0.003	1.1
			Chemical Total	7.1E-05	--	1.4E-04	--	2.1E-04		1.1	--	0.00	1.1
		Exposure Point Total						2.1E-04					1.1
	Exposure Medium Total							2.1E-04					1.1
	Groundwater	Site 3	1,1,2-Trichloroethane	--	1.9E-07	--	--	1.9E-07	Blood	--	0.006	--	0.006
			Trichloroethene	--	3.6E-08	--	--	3.6E-08	Liver	--	--	--	--
			Vinyl Chloride	--	2.4E-06	--	--	2.4E-06	Liver	--	0.009	--	0.009
			Benzo(a)pyrene	--	--	--	--	--	NA	--	--	--	--
			Dibenzo(a,h)anthracene	--	--	--	--	--	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	--	NA	--	--	--	--
			Alpha-BHC	--	--	--	--	--	NA	--	--	--	--
			Arsenic	--	--	--	--	--	Skin, CVS	--	--	--	--
			Chemical Total	--	2.6E-06	--	--	2.6E-06		--	0.02	--	0.02
		Exposure Point Total						2.6E-06					0.02
	Exposure Medium Total							2.2E-04					1.1
Medium Total								2.2E-04					1.1
Receptor Total							Receptor Risk Total	2.2E-04				Receptor HI Total	1.1

Note:

Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TINUS, 2004).

Total Blood HI	0.01
Total CVS HI	1.1
Total Liver HI	0.02
Total Skin HI	1.1

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION
NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	--	--	--	--	--	None Specified	--	--	0.0009	0.0009
			1,4-Dichlorobenzene	--	--	3.2E-10	--	3.2E-10	None Specified	--	--	0.0010	0.0010
			Chlorobenzene	--	--	--	--	--	Liver	--	--	0.002	0.002
			Benzene	--	--	2.5E-11	--	2.5E-11	None Specified	--	--	0.00007	0.00007
			Trichloroethene	--	--	1.7E-11	--	1.7E-11	Liver	--	--	0.0003	0.0003
			Bis(2-ethylhexyl)phthalate	--	--	2.1E-09	--	2.1E-09	Liver	--	--	0.009	0.009
			Hexachlorobenzene	--	--	9.8E-09	--	9.8E-09	Liver	--	--	0.009	0.009
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Barium	--	--	--	--	--	CVS, Fetus	--	--	--	--
			Chromium	--	--	--	--	--	None Specified	--	--	0.02	0.02
			Lead	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	None Specified	--	--	0.005	0.005
			Chemical Total	--	--	1.0E-07	--	1.0E-07		--	--	0.05	0.05
		Exposure Point Total						1.0E-07					0.05
	Exposure Medium Total							1.0E-07					0.05
Medium Total								1.0E-07					0.05
Receptor Total							Receptor Risk Total	1.0E-07				Receptor HI Total	0.05

From Basewide Groundwater Operable Unit Remedial Investigation Report, TtNUS (2002a).

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	--	--	--	--	--	None Specified	0.006	--	0.03	0.03
			1,4-Dichlorobenzene	1.7E-07	--	1.0E-07	--	2.7E-07	None Specified	0.002	--	0.03	0.03
			Chlorobenzene	--	--	--	--	--	Liver	0.004	--	0.04	0.05
			Benzene	5.0E-08		6.7E-09		5.7E-08	None Specified	0.002	--	0.001	0.004
			Trichloroethene	3.5E-08		5.1E-09		4.0E-08	Liver	0.004	--	0.009	0.01
			Bis(2-ethylhexyl)phthalate	3.8E-07		6.7E-07		1.1E-06	Liver	0.01	--	0.3	0.3
			Hexachlorobenzene	7.3E-06		3.1E-05		3.9E-05	Liver	0.04	--	0.3	0.3
			Arsenic	4.3E-06		--		4.3E-06	Skin	0.07	--	--	0.07
			Barium	--	--	--	--	--	CVS, Fetus	0.008	--	--	0.008
			Chromium	--	--	--	--	--	None Specified	0.05	--	0.2	0.2
			Lead	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	None Specified	0.02	--	0.04	0.06
			Chemical Total	1.2E-05	--	3.2E-05	--	4.4E-05		0.2	--	0.8	1.1
		Exposure Point Total						4.4E-05					1.1
	Exposure Medium Total							4.4E-05					1.1
	Groundwater	Torpedo Shops (Site 7)	1,3-Dichlorobenzene	--	--	--	--	--	None Specified	--	0.008	--	0.008
			1,4-Dichlorobenzene	--	1.7E-07	--	--	1.7E-07	None Specified	--	0.002	--	0.002
			Chlorobenzene	--	--	--	--	--	Liver		0.004		0.004
			Benzene	--	5.0E-08	--	--	5.0E-08	None Specified		0.002		0.002
			Trichloroethene	--	3.5E-08	--	--	3.5E-08	Liver		0.004		0.004
			Bis(2-ethylhexyl)phthalate	--	--	--	--	--	Liver		--		--
			Hexachlorobenzene	--	--	--	--	--	Liver		--		--
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Barium	--	--	--	--	--	CVS, Fetus	--	--	--	--
			Chromium	--	--	--	--	--	None Specified	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Vanadium	--	--	--	--	--	None Specified	--	--	--	--
			Chemical Total	--	2.5E-07	--	--	2.5E-07		--	0.02	--	0.02
		Exposure Point Total						2.5E-07					0.02
	Exposure Medium Total							2.5E-07					0.02
Medium Total								4.5E-05					1.1
Receptor Total							Receptor Risk Total	4.5E-05				Receptor HI Total	1.1

Note:
Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.
From Basewide Groundwater Operable Unit Remedial Investigaiton Report, TtNUS (2002a).

Total Skin HI	0.07
Total Liver HI	0.7
Total CVS HI	0.008
Total Fetus HI	0.008
Total None Specified HI	0.3

6/28/2004

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	--	--	0.0005	0.0005
			Chemical Total	--	--	--	--	--		--	--	0.0005	0.0005
		Exposure Point Total						--					0.0005
	Exposure Medium Total							--					0.0005
Medium Total								--					0.0005
Receptor Total							Receptor Risk Total	--				Receptor HI Total	0.0005

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	0.1	--	0.005	0.1
			Chemical Total	--	--	--	--	--		0.1	--	0.005	0.1
		Exposure Point Total						--					0.1
	Exposure Medium Total							--					0.1
	Groundwater	Site 15	Cadmium	--	--	--	--	--	Kidney	--	--	--	--
			Chemical Total	--	--	--	--	--		--	--	--	--
		Exposure Point Total						--					--
From Basewide Groundwater Oper	Exposure Medium Total							--					0.1
Medium Total								--					0.1
Receptor Total							Receptor Risk Total	--				Receptor HI Total	0.1

TABLE 9.7.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	--	--	7.9E-10	--	7.9E-10	Liver	--	--	0.002	0.002
			Benzo(a)pyrene	--	--	2.4E-08	--	2.4E-08	NA	--	--	--	--
			Antimony	--	--	--	--	--	Blood	--	--	--	--
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Nickel	--	--	--	--	--	Body Weigtht	--	--	--	--
			Silver	--	--	--	--	--	Skin	--	--	--	--
			Thallium	--	--	--	--	--	None Specified	--	--	--	--
			Chemical Total	--	--	2.5E-08	--	2.5E-08		--	--	0.002	0.002
		Exposure Point Total						2.5E-08					0.002
	Exposure Medium Total							2.5E-08					0.002
Medium Total								2.5E-08					0.002
Receptor Total							Receptor Risk Total	2.5E-08				Receptor HI Total	0.002

From Basewide Groundwater Operable Unit Remedial Investigation Report, TtNUS (2002a).

TABLE 9.8.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECORD OF DECISION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	4.5E-08	--	6.6E-09	--	5.1E-08	Liver	0.005	--	0.002	0.007
			Benzo(a)pyrene	3.8E-07	--	7.6E-06	--	8.0E-06	NA	--	--	--	--
			Antimony	--		--		--	Blood	0.06	--	--	0.06
			Arsenic	1.3E-05	--	3.2E-08	--	1.3E-05	Skin	0.2	--	--	0.2
			Nickel	--	--	--	--	--	Body Weigtht	0.02	--	--	0.02
			Silver	--	--	--	--	--	Skin	0.3	--	--	0.3
			Thallium	--	--	--	--	--	None Specified	0.4	--	--	0.4
			Chemical Total	1.4E-05	--	7.6E-06	--	2.1E-05		1.0	--	0.002	1.0
		Exposure Point Total						2.1E-05					1.0
	Exposure Medium Total							2.1E-05					1.0
	Groundwater	Area A Weapons Center (Site 20)	Trichloroethene	--	4.5E-08	--	--	4.5E-08	Liver	--	0.005	--	0.005
			Benzo(a)pyrene	--	--	--	--	--	NA	--	--	--	--
			Antimony	--	--	--	--	--	Blood	--	--	--	--
			Arsenic	--	--	--	--	--	Skin	--	--	--	--
			Nickel	--	--	--	--	--	Body Weigtht	--	--	--	--
			Silver	--	--	--	--	--	Skin	--	--	--	--
			Thallium	--	--	--	--	--	None Specified	--	--	--	--
			Chemical Total	--	4.5E-08	--	--	4.5E-08		--	0.005	--	0.005
		Exposure Point Total						4.5E-08					0.005
	Exposure Medium Total							4.5E-08					0.005
Medium Total								2.1E-05					1.0
Receptor Total							Receptor Risk Total	2.1E-05				Receptor HI Total	1.0

Note:
Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater.
From Basewide Groundwater Operable Unit Remedial Investigation Report, TINUS (2002a).

Total Skin HI	0.5
Total Liver HI	0.01
Total Blood HI	0.06
Total Body Weight HI	0.02
Total None Specified HI	0.4

APPENDIX E

SELECTED REMEDY COST ESTIMATE

NSB-NLON
GROTON, CONNECTICUT
SITES 3 AND 7 GROUNDWATER (Alternatives GW 1-2 and GW 2-2)
NATURAL ATTENUATION WITH MONITORING AND INSTITUTIONAL CONTROLS
Present Worth Analysis for Record of Decision

Year	Sites 3/7 - Alt. GW 1-2 Capital Cost	Sites 3/7 - Alt. GW 1-2 Annual Cost	Site 7 - Alt. GW2-2 Capital Cost	Site 7 - Alt. GW2-2 Annual Cost	Total Year Cost	Annual Discount Rate at 3.2%	Present Worth
0	$59,189		$59,713		$118,901	1.000	$118,901
1		$51,212		$49,264	$100,476	0.969	$97,360
2		$16,378		$14,441	$30,819	0.939	$28,937
3		$16,378		$14,441	$30,819	0.910	$28,040
4		$16,378		$14,441	$30,819	0.882	$27,171
5		$41,378		$39,441	$80,819	0.854	$69,042
6		$1,000		$1,000	$2,000	0.828	$1,656
7		$1,000		$1,000	$2,000	0.802	$1,604
8		$1,000		$1,000	$2,000	0.777	$1,555
9		$1,000		$1,000	$2,000	0.753	$1,506
10		$41,378		$39,441	$80,819	0.730	$58,982
11		$1,000		$1,000	$2,000	0.707	$1,414
12		$1,000		$1,000	$2,000	0.685	$1,370
13		$1,000		$1,000	$2,000	0.664	$1,328
14		$1,000		$1,000	$2,000	0.643	$1,287
15		$41,378		$39,441	$80,819	0.623	$50,387
16		$1,000		$1,000	$2,000	0.604	$1,208
17		$1,000		$1,000	$2,000	0.585	$1,171
18		$1,000		$1,000	$2,000	0.567	$1,134
19		$1,000		$1,000	$2,000	0.550	$1,099
20		$41,378		$39,441	$80,819	0.533	$43,045
21		$1,000		$1,000	$2,000	0.516	$1,032
22		$1,000		$1,000	$2,000	0.500	$1,000
23		$1,000		$1,000	$2,000	0.485	$969
24		$1,000		$1,000	$2,000	0.470	$939
25		$41,378		$39,441	$80,819	0.455	$36,772
26		$1,000		$1,000	$2,000	0.441	$882
27		$1,000		$1,000	$2,000	0.427	$854
28		$1,000		$1,000	$2,000	0.414	$828
29		$1,000		$1,000	$2,000	0.401	$802
30		$56,340		$49,135	$105,475	0.389	$40,997
						TOTAL PRESENT WORTH	$623,275